IN THE CLAIMS:

Please AMEND the claims as indicated below:

1. (CURRENTLY AMENDED) An optical waveguide that is formed on a substrate, comprising:

a curved ridge structure that is formed ~~on~~ by etching the substrate so as to have a curvature in a longitudinal direction of the curved ridge structure;

a curved optical path that is formed along the curved ridge structure; and

a buffer layer that covers a side of the curved ridge structure and that has a lower refractive index than a refractive index of the substrate.

2. (ORIGINAL) The optical waveguide according to claim 1, wherein the curved optical path is formed on a top side of the curved ridge structure.

3. (CURRENTLY AMENDED) The optical waveguide according to claim 1, wherein the curved ridge structure is formed ~~outside~~ by etching the substrate at least on an outer circumference of the curved ridge structure with respect to a center of the curvature.

4. (ORIGINAL) The optical waveguide according to claim 1, wherein the buffer layer is silicon oxide.

5. (ORIGINAL) The optical waveguide according to claim 1, wherein the substrate is made from lithium niobate.

6. (ORIGINAL) The optical waveguide according to claim 1, wherein the curved optical path has a curvature of not more than 4 millimeters.

7. (ORIGINAL) The optical waveguide according to claim 1, wherein the curved optical path has a width in a range from 5 micrometers to 9 micrometers.

8. (ORIGINAL) The optical waveguide according to claim 1, wherein a width of the curved optical path is equal to a width of the curved ridge structure.

9. (ORIGINAL) The optical waveguide according to claim 1, wherein the curved

optical path has a turning angle in a range from 90 degrees to 180 degrees.

10. (ORIGINAL) The optical waveguide according to claim 1, wherein a center line of the curved optical path is shifted from a center line of the curved ridge structure.

11. (ORIGINAL) The optical waveguide according to claim 1, wherein the curved ridge structure has a width of at most 6 micrometers plus a width of the curved portion.

12. (ORIGINAL) The optical waveguide according to claim 1, wherein the curved ridge structure has a height of at least 3 micrometers.

13. (ORIGINAL) The optical waveguide according to claim 1, further comprising:

a straight optical path that is coupled with the curved optical path;

a second ridge structure that is formed on the substrate along the straight optical path; and

a second buffer layer that covers a side of the second ridge structure and that has a lower refractive index than a refractive index of the substrate, wherein

the straight optical path is formed in and along the second ridge structure, and

the second ridge structure has a width increased along the straight optical path.

14. (ORIGINAL) The optical waveguide according to claim 1, further comprising:

an optical path that is coupled with the curved optical path and that has a width different from a width of the curved optical path; and

a coupler that optically couples the curved optical path with the optical path.

15. (ORIGINAL) The optical waveguide according to claim 14, wherein the coupler is an optical path whose width gradually changes from a width of the curved optical path to a width of the optical path.

16. (ORIGINAL) The optical waveguide according to claim 1, further comprising an optical path that is coupled with the curved optical path and that has a width different from a width of the curved optical path, wherein

the optical path is coupled with the curved optical path so that an axis of the optical path is shifted from an axis of the curved optical path.

17. (ORIGINAL) The optical waveguide according to claim 1, further comprising:

a straight optical path that is coupled with the curved optical path;

a second ridge structure that is formed on the substrate along the straight optical path; and

a second buffer layer that covers a side of the second ridge structure and that has a lower refractive index than a refractive index of the substrate, wherein

the straight optical path is formed in and along the second ridge structure, and

the second ridge structure is connected to the curved ridge structure so that an axis of the second ridge structure is shifted from an axis of the curved ridge structure.

18. (CURRENTLY AMENDED) An optical device for performing phase modulation, comprising:

an optical waveguide that includes

a curved ridge structure that is formed ~~on~~ by etching a substrate so as to have a curvature in a longitudinal direction of the curved ridge structure;

a curved optical path that is formed in and along the curved ridge structure; and

a buffer layer that covers a side of the ridge structure and that has a lower refractive index than a refractive index of the substrate; and

a signal electrode that is disposed on and along the optical waveguide.

19. (ORIGINAL) The optical device according to claim 18, wherein the optical waveguide includes two optical paths that are parallel to each other, and the signal electrode is disposed on and along each of the two optical paths.

20. (ORIGINAL) The optical device according to claim 18, wherein the optical waveguide further includes

a second ridge structure that is formed on the substrate straight in a longitudinal direction of the second ridge structure;

a straight optical path that is coupled with the curved optical path and that is formed in and along the second ridge structure; and

a second buffer layer that covers a side of the second ridge structure and that has a lower refractive index than a refractive index of the substrate,

optical signals transmitted through the curved optical path and the straight optical path interact with electric signals transmitted through the signal electrode, and

the curved ridge structure and the second ridge structure have a constant width.

21. (ORIGINAL) The optical device according to claim 18, wherein

the optical waveguide further includes

a first straight optical path that has an input end and a first connecting end that is coupled with one end of the curved optical path; and

a second straight optical path that has an output end and a second connecting end is coupled with another end of the curved optical path, and that is parallel to the first straight optical path, and

the input end and the output end are disposed on a side of the substrate.

22. (ORIGINAL) The optical device according to claim 21, wherein the curved optical path has a first curved portion and a second curved portion, the first curved portion has a constant curvature, and the second curved portion has a curvature gradually changing to be connected with one of the first connecting end and the second connecting end.

23. (ORIGINAL) A method of manufacturing an optical waveguide, comprising:

forming a pattern of titanium on a substrate, the pattern including a curved pattern for forming a curved optical path;

thermally diffusing the pattern at a high temperature;

forming a ridge structure by etching the substrate positioned at a side of the curved pattern, along a shape of the curved pattern; and

forming a buffer layer on a side of the ridge structure, the buffer layer being made of a material that has a lower refractive index than a refractive index of the substrate.

24. (ORIGINAL) A method of manufacturing an optical waveguide, comprising:

forming a proton exchange pattern on a substrate by proton exchange, the pattern including a curved pattern for forming a curved optical path;

forming a ridge structure by etching the substrate positioned at a side of the curved pattern, along a shape of the curved pattern; and

forming a buffer layer on a side of the ridge structure, the buffer layer being made of a material that has a lower refractive index than a refractive index of the substrate.